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Forecasting natural hazards and disasters in selected Southeast Asian countries: the need for cooperative action

Danilo C. Israel

Many countries in Southeast Asia are highly susceptible to weather and climate-related hazards and the disasters they cause.[1] However, because of the relatively still developing state of their economies and limited disaster response capabilities, some countries in the region like Cambodia, Indonesia, Lao PDR, the Philippines, and Viet Nam may be more vulnerable than others. These countries are also unique in that they sometimes commonly experience natural hazards and disasters that cut across national borders such as typhoons and droughts. Furthermore, their close proximity to each other may allow for some forms of intercountry cooperation to address these problems in the future, specifically in the case of weather and climate forecasting.

The most devastating typhoon of the 2009 Pacific typhoon season, Ketsana, named Ondoy in the Philippines, also affected Cambodia, Lao PDR, and Viet Nam. (Photo by NASA Earth Observatory)

[1] Weather is the state of the atmosphere over a short period, e.g., less than a year, while climate is the state over a long period, e.g., years. In this paper, natural disasters specifically include drought, extreme temperature, flood, mass movement wet, storm, and wildfire. Mass movement wet includes rockfall, landslide, avalanche, and subsidence.

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The author is Senior Research Fellow at the Institute. The views expressed are those of the author and do not necessarily reflect those of PIDS or any of the study's sponsors.

Table 1. Some important features of selected ASEAN countries, 2009

Characteristics	Cambodia	Indonesia	Lao PDR	Philippines	Viet Nam
Total area (sq km)	181,035	1,904,569	236,800	300,000	331,210
Land area (sq km)	176,515	1,811,569	230,800	298,170	310,070
Water area (sq km)	4,520	93,000	6,000	1,830*	21,140
Coastline (km)	443	54,716	0	36,289	3,444
Estimated population (millions)	14.5	240.3	6.8	97.9	88.6
GDP (billion dollars, purchasing power parity)	27.92	968.5	14.61	324.9	258.2

Source of data: World Fact Book, Central Intelligence Agency.
* Philippine statistics record the total territorial water area of the country at 2,200,000 square kilometers including the Exclusive Economic Zone (EEZ).

Table 2. Total and average annual number of natural disasters in selected ASEAN countries, 1990–2009

Period	Cambodia	Indonesia	Lao-PDR	Philippines	Viet Nam	All
Total disasters						
1990–1999	7.0	36	12.0	96	44	195
2000–2009	13.0	93	6.0	132	76	320
1990–2009	20.0	129	18.0	228	120	515
Average annual disasters						
1990–1999	0.7	3.6	1.2	9.6	4.4	19.5
2000–2009	1.3	9.3	0.6	13.2	7.6	32
1990–2009	1.0	6.5	0.9	11.4	6.0	25.8

Source of data: EM-DAT: The OFDA/CRED International Disaster Database

This *Policy Notes* reviews the occurrence of disasters caused by weather and climate-related hazards in Cambodia, Indonesia, Lao PDR, the Philippines, and Viet Nam, and the socioeconomic damages that they have caused. The *Notes* aims to highlight the increasing incidence of natural disasters in these countries and suggest some recommendations for cooperative action among them particularly in the forecasting of natural hazards.

Background of the countries

Of the five countries considered, Indonesia and the Philippines are archipelagic while Cambodia, Lao PDR, and Viet Nam are part of mainland Asia and share borders with each other. Lao PDR is landlocked while Cambodia borders the Gulf of Thailand and Viet Nam borders the South China Sea. Indonesia has the largest total land area, followed by Viet Nam, the Philippines, Lao PDR, and Cambodia (Table 1). Indonesia also has the largest water area and longest coastline. Population-wise, Indonesia also has the largest, followed by the Philippines, Viet Nam, Cambodia, and Lao PDR. In terms of gross domestic product (GDP), Indonesia again has the largest, followed by the Philippines, Viet Nam, Cambodia, and Lao PDR. By international standards, the economies of the five countries are considered still developing.

Occurrence of natural disasters

Available data indicate that during the decades of the 1990s and 2000s, weather and climate-related natural disasters[2] occurred in the five countries on a regular basis (Table 2). The Philippines had been the most disaster-prone country, with the number of incidents increasing from 96 in the 1990s to 132 in the 2000s, for a total of 228 disasters or an

[2] A natural disaster occurs if at least 10 people are killed and/or 100 or more are affected and/or an appeal for international assistance is made or a state of emergency is declared.

average of 11.4 disasters annually during the last two decades. Following the Philippines in terms of the number of disasters are Indonesia, Viet Nam, Cambodia, and Lao PDR in that order. Indonesia actually had less disasters compared to Viet Nam in the 1990s but more in the 2000s. Of the countries, only Lao PDR had fewer disasters in the 2000s than in the 1990s. On the whole for the five countries, the number of disasters was higher in the 2000s at 320 than in the 1990s at 195, indicating the increase in the occurrence of disasters in the last two decades.

Most of the natural disasters in Cambodia, Lao PDR, and Viet Nam, countries which are traversed by the Mekong River, were floods brought about by storms and occasional typhoons. In Indonesia, the disasters included floods, landslides, drought, and forest fires. Meanwhile, about 15–20 typhoons occurred in the Philippines every year which brought about major floods, landslides, and other related disasters. As earlier indicated, some of the typhoons that originated in the Philippines also travelled westward to Viet Nam, Cambodia, and Lao PDR. A few typhoons also reached other neighboring countries like Japan, China, and Taiwan, sometimes bringing significant destruction in these countries.

People affected by natural disasters

During the 1990s and 2000s, the number of people affected by natural disasters in the five countries has been substantial as can be seen in Table 3. Following the pattern of occurrence of natural disasters, the Philippines had the most number of people affected, increasing from 35.2 million in the 1990s to 49.8 million in the 2000s for a total of 85 million or an average of 4.3 million yearly for the past two decades. The Philippines was followed by Viet Nam, Cambodia, Indonesia, and Lao PDR in that order. Cambodia, the Philippines, and Viet Nam had more people affected by natural disasters in the 2000s than in the 1990s while the reverse was true for Indonesia and Lao PDR. For all of the five countries, the number of people affected by natural disasters was higher in the 2000s at 84.3 million than in the 1990s at 69.5 million, indicating the increasing number of people affected during the past two decades.

Socioeconomic damages due to natural disasters

Israel, in an earlier paper (2010), presented the various social and economic sectors in a

Table 3. Total and average annual number of people affected by natural disasters in selected ASEAN countries, 1990–2009

Period	Cambodia	Indonesia	Lao-PDR	Philippines	Viet Nam	All
Total affected						
1990–1999	7.9	6.4	2.8	35.2	17.2	69.5
2000–2009	8.4	3.8	1.4	49.8	20.9	84.3
1990–2009	16.3	10.2	4.2	85.0	38.1	153.8
Average annual affected						
1990–1999	0.78	0.6	0.3	3.5	1.7	6.9
2000–2009	0.83	0.4	0.1	5.0	2.1	8.4
1990–2009	0.81	0.5	0.2	4.3	1.9	7.7

Source of data: EM-DAT: The OFDA/CRED International Disaster Database

country that can be potentially affected by weather and climate-related natural hazards and disasters. He pointed out that there are both direct and indirect damages brought about by natural disasters. The secondary data on the value of socioeconomic damages presented in Table 4, however, reflect only direct damages but not indirect damages. Thus, these figures on socioeconomic damages can be considered conservative estimates as they are only a fraction of the value of total damages caused by natural disasters.

Among the countries, Indonesia had the highest value of damages at $10,082 million in the 1990s and $1,765 million in the 2000s for a total of $11,847 million or an average of $592.35 million yearly during the past two decades. The country was followed by Viet Nam, the Philippines, Cambodia, and Lao PDR in that order. Viet Nam had higher socioeconomic damages in the 2000s than in the 1990s while the reverse was true for the other four countries. For the five countries, the value of socioeconomic damages was higher in the 1990s at $15,963.2 million than in the 2000s at $9,255 million for a total of $25,238.2 million in the last two decades.

Such figures indicate that while the incidence of and number of people affected by natural disasters in totality in the five countries had been increasing in the last two decades, the value of socioeconomic damages had been decreasing. This appears to be inconsistent but some explanations can also be put forward.

First, as earlier mentioned, the socioeconomic damages included in the computations are only direct damages of natural disasters. The inclusion of all damages could change the figures. Second, the data on socioeconomic damages may be preliminary and need to be reviewed given the difficulty of putting money values on socioeconomic damages.

But even with the current results, the generated values of the socioeconomic damages for the five countries are clearly substantial and a real cause of concern. Still, recomputation of the socioeconomic damages is in order when more accurate data and information become available.

Table 4. Total and average annual value of socioeconomic damages due to natural disasters in selected ASEAN countries, 1990–2009

Period	Cambodia	Indonesia	Lao-PDR	Philippines	Viet Nam	All
Total value of damages ($ million)						
1990–1999	252.5	10,082.0	308.0	2,692.0	2,628.7	15,963.2
2000–2009	213.0	1,765.0	101.0	2,121.0	5,055.0	9,255.0
1990–2009	465.5	11,847.0	429.0	4,813.0	7,683.7	25,238.2
Average annual value of damages ($ million)						
1990–1999	25.3	1,008.2	30.8	269.2	262.9	1,596.3
2000–2009	21.3	176.5	10.1	212.1	505.5	925.5
1990–2009	23.3	592.35	21.5	240.7	384.2	1,261.9

Source of data: EM-DAT: The OFDA/CRED International Disaster Database

Benefits from NMHS improvements and cooperation

An important way of reducing the negative impacts of natural

hazards and the disasters they cause is to generate and provide accurate and timely weather and climate forecasting data and information. In this regard, improvements in the existing national meteorological and hydrological services (NMHS) of a country may be needed. Recent studies have indicated that investments of a country in NMHS would result to very low cost-benefit (C/B) ratios or high B/C ratios. The specific benefits from NMHS improvements are itemized by sector/industry in Table 5.

Table 5. Main benefits and impacts of NMHS improvements for a country

Sector/Industry	Main Benefits and Impacts
Road traffic	Accident reduction, savings in material and working times (road maintenance)
Railway traffic	On-time arrivals (time-value), savings in passenger and working times (railway maintenance)
Maritime	Reduction of accidents and environmental damages, fuel savings, more efficient rescue operations
Aviation	Reduction of accidents and emissions; savings in fuel, passenger times, materials, and working times (airport maintenance)
Construction production	Possibility of eliminating serious construction problems beforehand (risk-controlling system)
Energy production	Prediction of power demands, power failure reduction, savings in material and working times (maintenance), energy savings
Air quality monitoring and warnings	Reduction of adverse health impacts; saving of human lives in possible environmental accidents (evacuations)
Flood protection	Saving of human lives, savings in material damages, more efficient rescue operations
Agriculture production	Plant protection, crop dusting, right timing of harvesting

Source of information: Hautala et al. 2008

Furthermore, since some types of natural hazards such as typhoons and droughts have transboundary implications, it would serve well for governments, particularly those of Cambodia, Indonesia, Lao PDR, the Philippines, and Viet Nam to cooperate and coordinate with each other and come up with a subregional integrated approach for weather and climate-related forecasting.

Recommendations

Over and above what has been undertaken for the forecasting of natural hazards and disasters at the level of the Association of Southeast Asian Nations (ASEAN), Cambodia, Indonesia, Lao PDR, the Philippines, and Viet Nam may undertake further common initiatives to strengthen their capabilities for the purpose. The following recommendations are put forward for the pursuit of cooperation and coordination among the countries in the forecasting of natural hazards and disasters:

- Sharing of data and information among countries, particularly on the forecasting of natural events with transboundary implications;
- Conduct of common training and development programs among countries of their NMHS personnel;
- Intercountry personnel visitation and exchange for improved cooperation and coordination;
- Conduct of common research and development activities especially on transboundary weather and climate-related issues;
- Undertaking of international workshops

and other forums to promote exchange of relevant data and information;

- Creation of intercountry committee or organization for the forecasting of natural hazards and disasters;
- Promotion of an integrated and intercountry NMHS to reduce cost and increase efficiency; and
- Coordination of search for outside sources of funds for future NMHS improvements.

Summary and conclusion

In general, Cambodia, Indonesia, Lao PDR, the Philippines, and Viet Nam have experienced the increasing occurrence of weather and climate-related hazards and disasters, some of which they commonly share because of their close proximity to each other. The still developing state of their economies also makes them more vulnerable to natural events. Due to their closeness and similarity of socioeconomic conditions, cooperation and coordination among the countries in addressing natural hazards and disasters particularly in the area of weather and climate-related forecasting would be a much welcome approach. Such action would help make the overall management of natural hazards and disasters more efficient and effective leading to a reduction of their negative impacts.

For further information, please contact

The Research Information Staff
Philippine Institute for Development Studies
NEDA sa Makati Building, 106 Amorsolo Street, Legaspi Village, 1229 Makati City
Telephone Nos: (63-2) 894-2584 and 893-5705
Fax Nos: (63-2) 893-9589 and 816-1091
E-mail: disrael@mail.pids.gov.ph; jliguton@mail.pids.gov.ph

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